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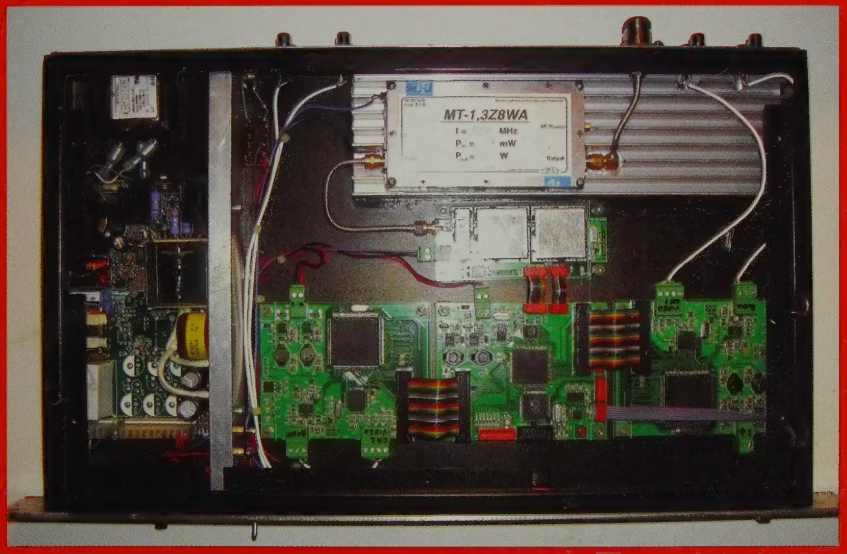
# Amateur Television Quarterly

DIGITAL ATV

SBARC ATN EVENT

EARLY TV HISTORY

Amateur Television Network
at the Santa Barbara Hamfest

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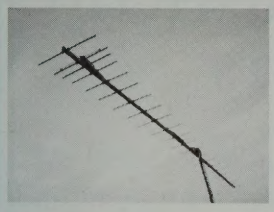

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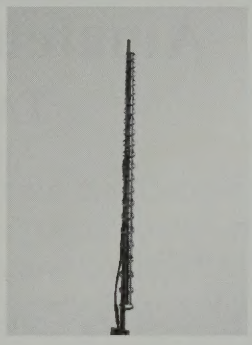

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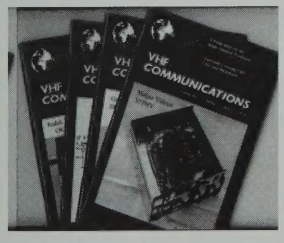


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# AMATEUR TELEVISION QUARTERLY

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# Sync Buzz Editorial

*- Bill Brown WB8ELK*

This issue is delayed due to a burglary and major theft in my home. I came home from a vacation to find my backdoor kicked in, the house completely ransacked and discovered that all my computers and laptops as well as my Icom IC-R3 and two HTs had been stolen.

The worst part of all this is that I lost the ATVQ computer with all my layout templates and files and they also stole my backup USB drive leaving me with two years of files completely gone forever. I was left with the daunting task of trying to get my new computer and the magazine layout templates back to the point before the theft starting from scratch and have finally done so.

Since we are now behind in our editorial calender, we plan to publish the next two issues about 2 months apart instead of the usual 3 months to catch up to our original publishing schedule.

I've devoted the last couple of months since the theft to installing home security systems and researching remote computer backup services and will describe some of what I've done in an article in upcoming issues.

In the future if someone gets past my wireless cameras, the motion and door sensors and dares to test out the "Danger, High Voltage" signs posted in the windows and doors, I'll still have my remotely accessable computer files that I can easily restore even if they clean my house out to the bare floors.

I wanted to express my heartfelt appreciation for the patience and understanding of our subscribers and advertisers during this time.

This month we are featuring how to get started with digital methods for amateur TV and will have more articles of that nature in the next few issues.

- Bill WB8ELK

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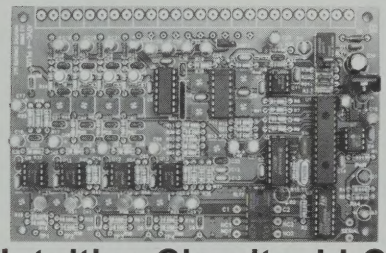

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# SBARC Hamfest and Annual ATN Event

*So Many ATVers, So Little Time...* *- Rod Fritz WB9KMO*

*(Photos provided by SBARC, KE6BXT, AC6RB and WB9KMO)*

**Earl Warren Showgrounds Marquee**

August 15, 2009 was a very special day in Santa Barbara. Sure it was the 40th anniversary of Woodstock, but that wasn't what made it so special. Sure it was the umpteenth birthday of Bill Brown, WB8ELK (Happy Birthday, Bill!), but that wasn't it either. The catalyst of the special day was **Prepare 2009 - ARRL Southwest Division Convention** and the **Amateur Television Network Summer Meeting.**

**SBARC Rover – Those ATV Antennas are Soooo High!**

The event drew hundreds of radio amateurs to Earl Warren Showgrounds in Santa Barbara, California. It was a great opportunity to showcase ATV and SSTV, which we took full advantage of. The Santa Barbara Amateur Radio Club (SBARC) hosted the event and set up countless displays. The SBARC Rover van has a 50' foot mast with ATV and HF antennas and equipment. The van is commonly used for public service events and it's always available in case of emergency.

**All Ages Enjoy Learning about SSTV**

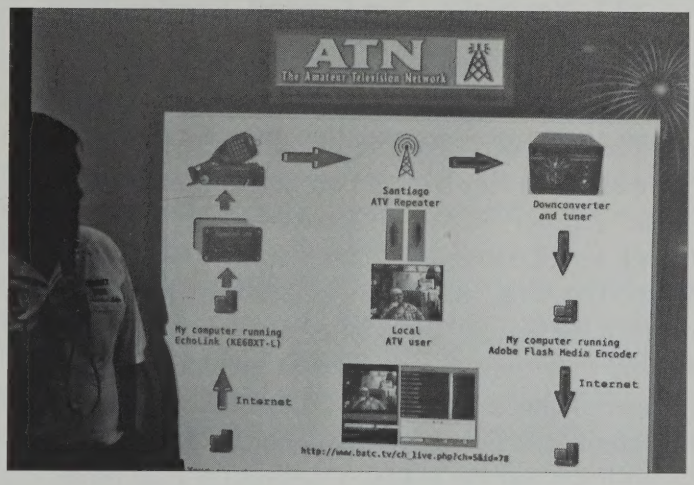
The interest in ATV, SSTV and other specialized communication modes was astounding. It seemed like everyone wanted to learn about what we were doing. Mike "Jug" Jogoleff WA6MBZ and Rod Fritz WB9KMO from the SBARC ATVSIG group set up VHF and HF rigs to demonstrate SSTV, RTTY, PSK31 and other specialized modes. Attendees were anxious to see the various computer programs in operation and they got quite a kick out of some of the SSTV pictures we had in our slideshows.

**George AC6RB Directing the Spanish/English ATV Net**

One of the highlights of the day was the live Spanish/English ATV Net directed by George Migliarini AC6RB. This world-class ATV net is a weekly event on ATN every Saturday at noon Pacific Time. It can be watched world-wide on the www.batc.tv website ATV Repeater W6ATN screen. At the convention, George remotely controlled this net over the Internet. Several ATN members on our California ATV repeaters exchanged live video with several ATVers in Argentina. The wide-screen monitor in the picture shows six simultaneous video sources being received. This is amazing to watch and it's even more interesting to get on the air and exchange information about ATV activities and life as an amateur radio operator in our respective countries.

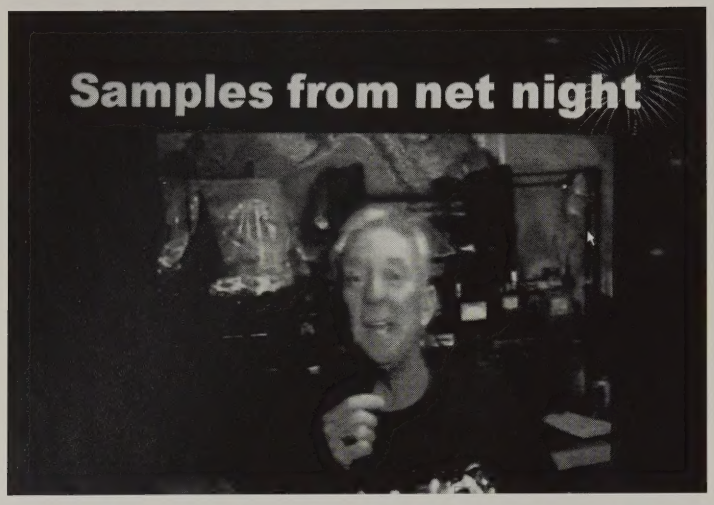
**Enjoying Food and Friends at the ATN Summer Meeting**

There's nothing like a Hamfest to generate a big appetite. It was no surprise that ATN members were among the first in line – we're very action-oriented. The ATN Summer Meeting is our annual social event and we used this convention as an excuse to invite everyone to Santa Barbara. I was pleased that so many of our members and friends traveled long distances to celebrate with us. After eating, we gave reports from each of the Amateur Television Network ATV communities. Then it was time for the ATV Presentation.



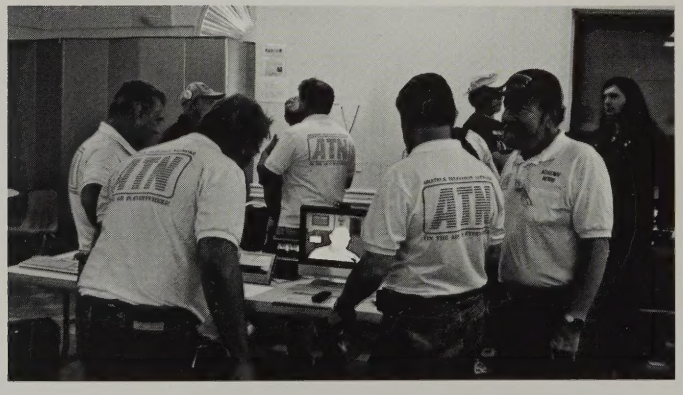

**Don KE6BXT Explaining How We Use EchoLink**

Mike Collis WA6SVT and Don Hill KE6BXT presented INTRODUCTION TO ATV – How to get on Amateur Television and Providing Public Service with ATV. Mike presented the technical side of Amateur Television in a relatively non-technical way, describing the equipment and how ATV systems work. Don focused more on ATV activity, public service and how we use the Internet to reach out and get more hams involved. Don showed a video of ATVers transmitting live video of firemen fighting a roof fire during the Tournament of Roses Parade. The clip clearly demonstrated how live video communicates a lot more information in a short time than voice or still pictures.




**ATN Net Night – Net Control, Gordon West WB6NOA**

Don's presentation about ATV activity highlighted our Tuesday ATN "Net Night" with a video called Samples from Net Night. Our net controls are Mark "Fish" Fischer W6MAF, "Rockin' Chair" Dave Couch KA6DPS and Gordon "Gordo" West WB6NOA. Yes, they're all celebrities and they deserve the status. Week after week at 7:30 PM Pacific time they do an excellent job coordinating dozens of check-ins from our linked ATN ATV repeaters, live EchoLink audio connections, Internet video links and the BATC.TV-W6ATN chat room. There are often special theme nights where we show off our special gadgets, pets or costumes. Everyone is welcome to watch and check-in. We are truly "On the Air to Everywhere" as our ATN logo proudly proclaims.

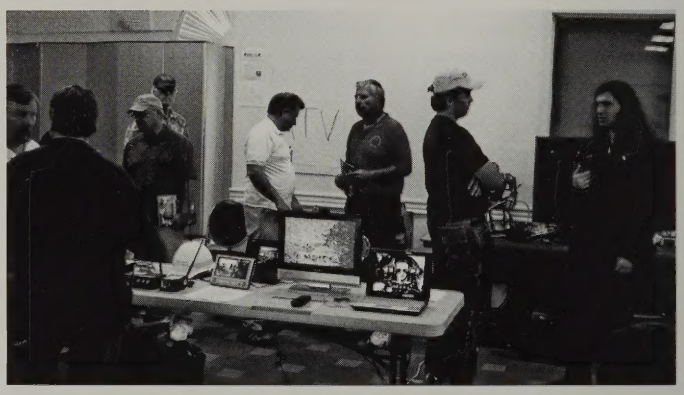


**ATN Is On the Air to Everywhere**

ATN may be on the air to everywhere, but in Santa Barbara we currently only have three active ATVers. Over the years, we've had peaks of ATV activity in Santa Barbara, but since the late 1970's when I arrived, we never had more than five of us active at a time. I've long felt that six active ATVers was a critical mass that would allow us to more effectively support local events and promote growth in ATV. We're very lucky that we are part of the Amateur Television Network so we always have plenty of ATVers from everywhere within range.

**2009 Amateur Television Network Group Picture**

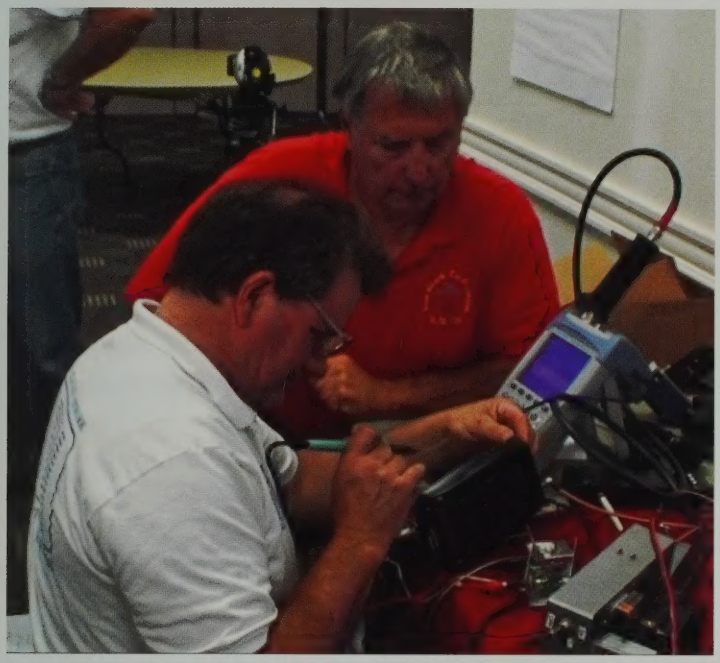
We didn't get an accurate count at the convention, but it appeared there were more than twenty active ATVers in Santa Barbara at one time! We couldn't get everyone together all at once, but many of us assembled for the 2009 ATN Group Picture. It was a rare pleasure to have so many ATVers visit Santa Barbara. I long for the day when we get that many locals on ATV. We're working on it and the convention clearly raised local awareness. Since then, I've had several local hams show sincere interest to get on the air.



**An Excellent ATN Display**

With recent experience putting on a demonstration at the Orange County Fair, we were fortunate that Don Hill KE6BXT and Norm Hill KD6OMV were able to assemble such an excellent ATV display for the con-

vention. A credit to their efforts, there was always a crowd around the equipment and video demos they had assembled. Well done!



**Mike WA6SVT – Getting Max Power Out**

Prior to the convention, we encouraged hams to bring in equipment to be checked and adjusted in our Workshop Booth. Mike Collis WA6SVT is shown aligning Mike Maronta KC6YNQ's 2.4 GHz transmitter and amplifier. The operation was successful and the result gives Mike much more power to shoot at the ATV repeater. Mike Collis had a very busy weekend, driving about 200 miles to Santa Barbara, helping install two antennas at the Santa Barbara ATV repeater site, reporting on many of the ATN repeaters during the ATN Summer Meeting, making an ATV presentation, providing technical information at the ATV Booth and working on equipment in the Workshop Booth. With his family along, he still found time to show them around the area from Carpinteria to Solvang. A good time was had by all.

**ATV and Robots – The Next Big Thing**

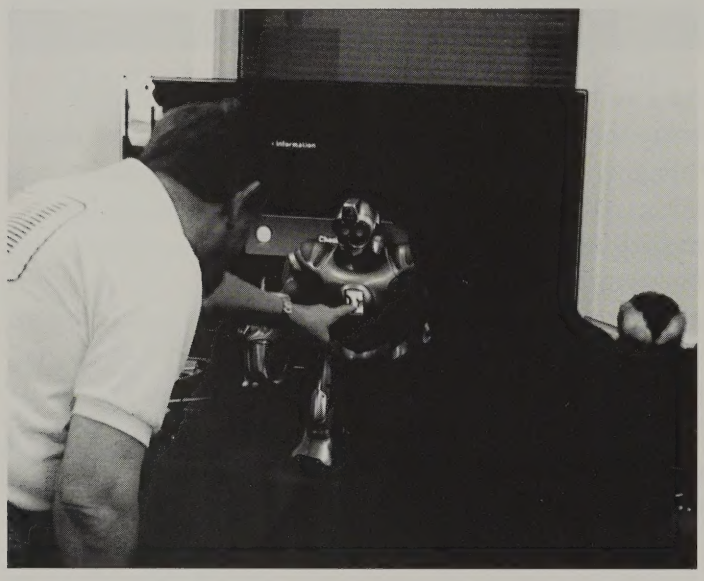
As I've been doing for a long time now, I always bring robots to ATV demos. It's obvious to me that this may be "the next big thing" in ATV. Similar things like this are popular, like ATV in remote controlled models, but robots and ATV are a unique combination of technologies. I've never seen the excitement in young people that you get when you bring in robots that they can interactively play with. Add together the elements of remote control, programmability, animation with personality, recording sound, pictures and video, displaying pictures and video with audio, and real-time two-way video transmissions and

it really makes a kid's day.

**Wowwee Robots – Kid's Love Them!**

Though I primarily use robots as attention-getters, they have a lot of potential for all sorts of ATV activi-

ties. The best value I see right now is to get young people to pay attention to technology and amateur radio. In Santa Barbara, we take amateur radio to Elementary School Science Nights several times a year. We also take amateur radio to scouts as part of J.O.T.A. The robots get their interest and then we switch the conversation to amateur radio and ATV. These young people played with this robot for over two hours. I'm sure they went home with a very good memory of the time they spent at the convention



in the ATV booth.

**Robots and ATV – Fascinating for All Ages**

Interest in robots and ATV isn't limited to young people. Even people as old as Don KE6BXT (sorry about the age reference Don) find them fascinating. If you ever want a new thrill in ATV, get one of these robots and make it transceive cross-band on ATV. The fun you'll have at ATV demos and the interest you see in what you've built will amaze you.

**And the Big Winner Is…**

Last, but not least, we need to acknowledge the big winner of the day. Tom Board WB6HYH, ATN Vice President won a very nice gas-powered generator in the raffle. I don't think he's in this picture. Rumor has it he was out in his car hugging the new acquisition. Rest assured that ATV will be on the air from Rancho Cucamonga even when the AC power is off.

The convention was originally planned to be two days long. We actually had planned a lot more activities than we could possibly do in one day. So many ATVers, so little time… We did plenty, but have more up our sleeves for next time.

Thank you to all who came, set up demonstrations, made presentations and interacted with us at the convention. You all made this a very a special event, one I'll remember fondly for a long time.

Rod Fritz, WB9KMO

ATVQ

**The Big Winner**

# The Tech Guy is IN

*- Mike Collis WA6SVT*

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Crestline, CA 92325
*email: wa6svt@atvquarterly.com*

**Q:** *After the ATV forum at Dayton I was asked about TV modulators for use in ATV. What types are best suited for ATV.*

**A**: TV modulators come in three main categories, Consumer, MATV-CATV and Broadcast. Most consumer types are used to put analog audio and video on a single TV channel to permit using an analog TV to display the video. The modulators are usually not VSB and very simple modulators that I would not recommend for ATV.

Broadcast modulators for analog may be available cheaply now that broadcast TV has moved to digital. The modulators are quite sophisticated with white clip, sync level, all kinds of equalization and adjustments. If all the video processing is on board the unit, It may make a fine ATV modulator.

The most used modulator type used in ATV is the MATV and CATV types, they usually are rack mounted and VSB filtered in the IF at 45.75 MHz combined with a separate aural carrier (audio) and then up converted to the desired VHF, UHF or CATV channel.

Be sure to the modulator is the heterodyne VSB filtered unit. Most of the higher end units (see ATV Research on the back cover, they have the modulators we are discussing) frequency agile +60 dBmv output level and have white clip and video filtering to reduce splatter.

Amateur Television Network (www.atn-tv.org) all use CATV modulators. Most of the modulators can provide enough output to drive a small brick amp to a few watts on 70 cm band. 33 cm and 23 cm band use requires up converting the hyper band output in the 300 MHz area to either band. Harlan Technologies (see their ad in this issue) has a 900/1200 MHz ATV demo board that makes a good local oscillator after cutting the 6.0 and 6.5 MHz subcarrier output circuit trace and turning all the way down on the video deviation pot.

The output is in the +17 to +20 dBM range, it has an SMA output connector too. For use at 23 CM band, I set the dip switches for 930 MHz and feed this signal into a Mini Circuits +17 dBM mixer's (I like the ones in its own case with SMA connectors) LO input and modulator into the IF input. The mixer's RF output needs to be filtered to remove the LO and LO minus IF outputs and leave the LO plus IF output. In the Spring 2004 issue (vol. 17-2), page 30 of ATVQ there was an article to build a three pole filter using small .6-10 pf Johansson caps, #16 brass or copper plated brass hobby tubing and sheets to make a small filter.

The output is about 8 to 9 dB lower than 70 cm due to mixer and filter loss. Mini Circuits have small class A 100 mw amp modules in the $110 class that will work great to provide 30 dB gain and I set the drive to about 50 mw and drive a Down East amp to the desired output level. For repeater service, it is desirable to add an output filter (DCI makes some good filters for ATV) to fully filter your output channel.

Set the aural carrier to -12 dB below the visual carrier while the video is unplugged (during sync time the peak sync tip to aural carrier is about -10 to -11 db below the visual carrier).

That's it for the Tech Guy, see you next issue and keep those questions coming.

ATVQ

# Digital Television – The New Ham Frontier

8/29/09
Art Towslee
WA8RMC
towslee1@ee.net

**Introduction –**
USA broadcast digital television started in the early 90's and the official transition to all digital took place in June of 2009. Amateur digital television started somewhere around 2000 mainly in Europe with on air signals not appearing until around 2002 when some digital board sets became available. Since then amateur digital TV repeaters in Europe have been increasing in popularity but sadly the interest seems to be lacking in the USA. In January of 2004 the ATCO Group (Amateur Television in Central Ohio) in Columbus, Ohio installed a DVB-S digital output to their repeater which has been in service 24-7 since then. As of July 2009, the ATCO Group is still the only one in the USA with a digital ATV (Amateur Television) repeater output.

The ATCO repeater digital output uses DVB-S modulation which we believe is the best choice for amateur television. The following discussion details more fully why we feel it is best along with operational experiences to back it up. I know of no other group, USA or Europe, that justifies it with "in service" data. Therefore, we are able to back up our statements with results and not just theoretical details.

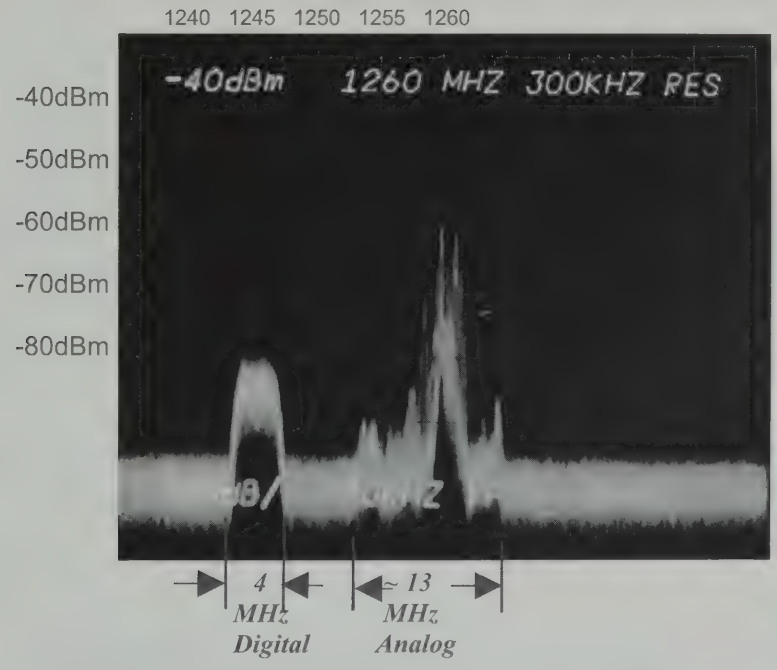
## DATV advantages over analog.

- **Picture quality is near perfect.**
  Strong and weak signals are all "P5" which is a snow free signal. Historically, analog amateur television signal strengths are indicated by the "P" unit system where P0 is a barely detectable signal and P5 is snow free. The strengths increase in 6dB steps from P0 to P5 so P5 is 6 x 5 = 30dB stronger than P0. That's for **ANALOG.** A digital signal that produces a blank receiver screen with a "P0" signal will produce a "P5" or snow free picture if it's only 1-2dB stronger. Therefore, in the analog world, if the signal strength increased 1-2 dB greater than P0, the viewer would see a barely discernable picture; in the digital world he'd see a snow free picture.

- **Noise and Multipath cancellation possible.**
  The DVB-S QPSK modulation scheme uses forward error correction to cancel the effects of atmospheric/man made noise and multipath (ghosting). The noise is handled by Viterbi and multipath is handled by Reed-Solomon software algorithms which are highly complex effective ways of handling the data streams but beyond the scope of this discussion. Since the DVB-S modulation scheme is intended mainly for satellite to ground communication, multipath is minimal so correction requirements are also minimal and simple but adequate for ATV applications.

- **Noise reduction.**
  As mentioned above, the Viterbi coding algorithm reduces noise due to atmospheric and man made influences but is minimal. Here also, Hams are willing to tolerate some noise disturbances in the picture. However, it doesn't show up as the typical noise flashes in the picture as seen on an analog screen. Instead it will appear as either a momentarily frozen picture or as momentary checkered squares scattered through the picture. So, as you can imagine, it would be intolerable for a commercial broadcast signal but quite acceptable for Hams!

**Can occupy less bandwidth.**
A commercial 8VSB digital broadcast signal occupies a fixed 6MHz bandwidth and is not subject to modification. The DVB-S signal bandwidth however, can be tailored to meet the users' requirements. Therefore it can be made wider or significantly narrower than 6MHz with corresponding tradeoffs. If a narrower bandwidth is needed, video quality will suffer and fast motion may pixelate. By "pixelate" we mean that checkered squares will appear in the picture where the data cannot be refreshed accurately. For most Ham applications, we are not showing video of race cars and the person "on camera" is usually not moving rapidly, so again, this is normally not a problem. We have found that a Forward Error Correction (FEC) value of about 3/4 with a 3.125 megSymbol rate is adequate for normal motion with 2 video streams in a 4MHz channel.




**Less transmit power required than analog for same range.**
Because the digital signal contains more data than an equal analog signal, less power is needed to transmit an error free signal. Also, the signal envelope contains more peak power spread out more evenly across the occupied bandwidth allowing more information within the carrier envelope. An analog signal has most of the power closest to the signal center carrier but the digital signal is spread out more evenly across the spectrum. As a result, the digital signal looks squarer as viewed on a spectrum analyzer seen above. As a rough rule of thumb, the digital signal transmit power can be as low as $1/10^{th}$ of the power of an analog signal for the same received signal quality. Example: The ATCO digital QPSK 2.5 watt 1245MHz signal is received about the same as its 30 watt 1260MHz analog signal. (Both signals use identical antennas at the same elevation 10 feet apart).

**It's neat to be on the cutting edge (bragging rights).**
Last but not least, it's neat to be able to tell people that your signal is the latest digital technology coming from a home built Amateur transmitter. A number of club members have been acquired just because of that fact. Everyone likes to be a leader, right?

## DATV disadvantages

**Most DATV is in Europe.**

Up to this time, it's clear that the European Hams are more creative in regard to DATV. They pioneered it in the early stages starting at the turn of the 21st century. I don't know the real reason why but guess that they are still building their own equipment whereas many Americans have given in to simply buying what they need and simply "plug it in" to get them on the air. That's not necessarily BAD but it DOES limit DATV operation here in the USA.

**Transmit boards are expensive.**

Transmit boards available from European sources are NOT CHEAP and as we all know USA Hams are not exactly that! The board sets usually will run over $1500 for a 2.5 watt signal! It is therefore clear to me that the Europeans who spent a few years writing and perfecting the needed code want to be reimbursed for their effort. I can't blame them but it doesn't sit well with our "cheap US Hams" so to this date…no economical solution.

**Transmit boards are difficult to build.**

Well, not really, but the **hardware** is the easy part as a number of manufacturers have created individual IC's at reasonable prices but writing the **software** code for these is another matter. What we REALLY need is to have some experienced Ham software engineers knowledgeable with digital TV sit down and help write some useable code for a board set. Creating the hardware around the code is "a piece of cake" but I don't know of anyone willing to take time away from their "real job" long enough to create useful software for the good of DATV.

**Modulators require interlaced video.**

This is not a major drawback but one must be aware of it. To my knowledge, the software written for all boards available now require full interlaced NTSC video for error free MPEG-2 compression to take place. Almost all cameras output interlaced video but ID generators DO NOT. The most common ID generator is the Elktronics ID board used to generate the station ID for most ATV repeaters but it does not have interlaced video so as a result, the signal pixelates and freezes frequently making the signal almost unusable. I know of no commercially available interlaced video ID boards. Because of this the ATCO group custom made one from a Sandisk picture frame board and loaded it with the needed video ID slides. Maybe future software designs will overcome this problem.

**Transmit delay of 1 to 2 seconds.**

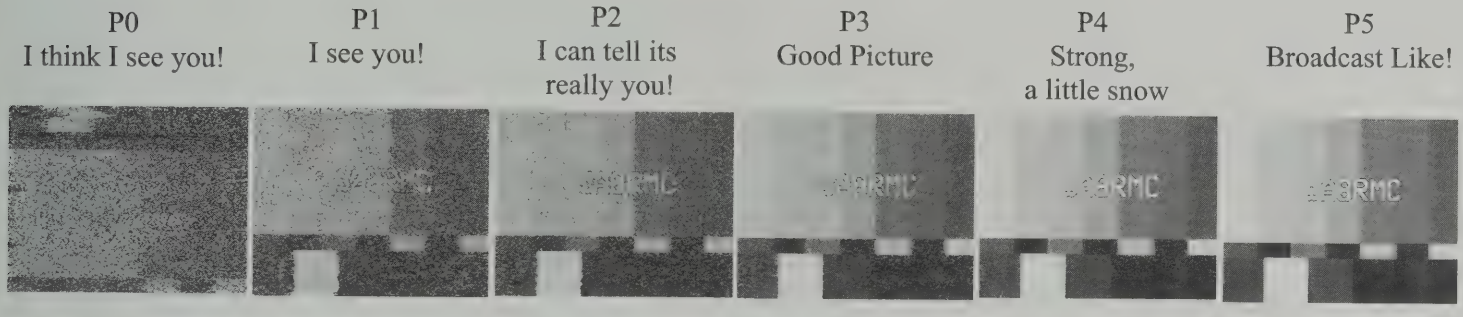
There is about a 1 to 2 second latency delay during the MPEG-2 compression (transmitter) and decompression (receiver). Most of the time it is of novel interest being able to watch the analog transmission and then the digital transmission occur with a 1 to 2 second offset. However, if any DATV linking between repeaters is anticipated, it may be very cumbersome when using full duplex for people at each end to wait a couple of seconds before responding to a given comment. (Full duplex will create a 2-4 second delay). However, that may be fun to watch also, so who knows, maybe that's more entertainment!

**Ungraceful fade margins.**

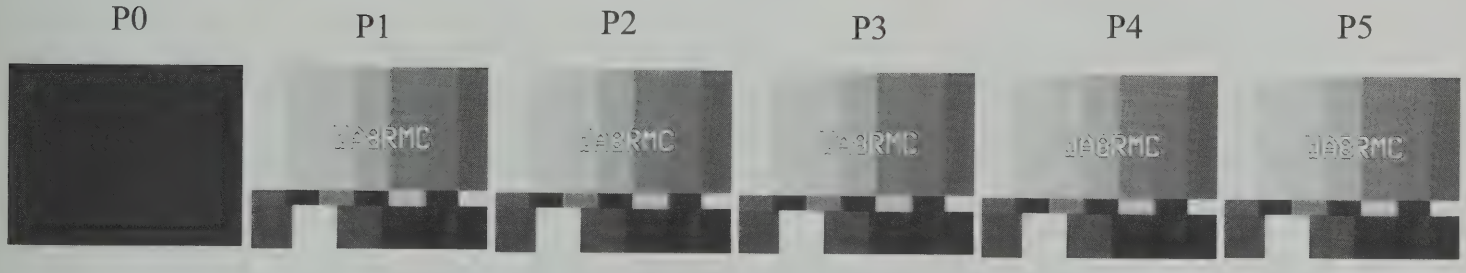
Analog has a graceful fade margin. That is, the picture is recognizable while noise and signal fading increase and decrease from "snow free" down to within about 3dB of disappearing altogether. Digital, however, is unforgiving as it stays absolutely snow free down to within about 1-2dB of the threshold. Therefore the digital signal will remain viewable longer, but when that "cliff effect" point is reached, the signal is totally gone with no visible traces of it. The

corresponding analog signal may have excessive snow but viewable traces of the signal remain allowing antenna optimization efforts. So analog has an advantage when receiving a weak DX signal under rapid fading conditions.

# *Analog ATV Signal Reporting*




# *DATV Signal Reporting*



## Broadcast standards – overview - major standards

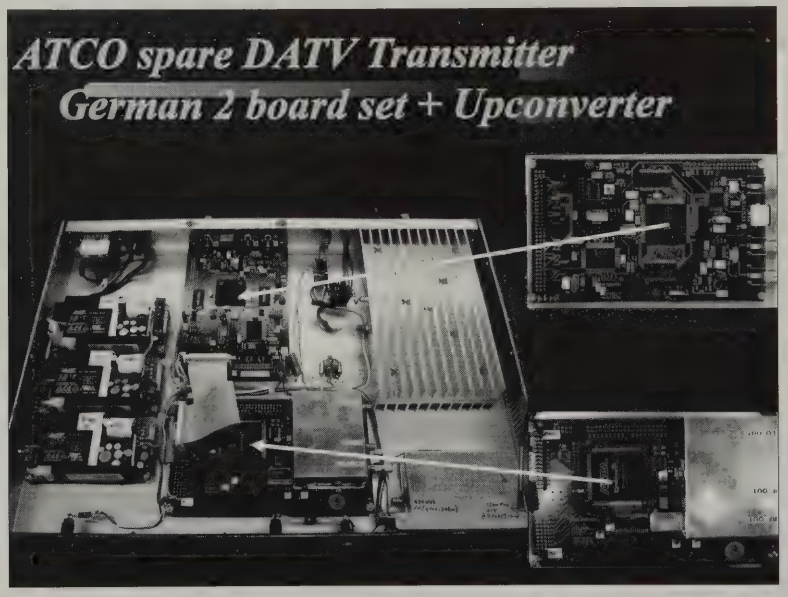
ATSC (8VSB) North America.
DVB-T (CODFM) Europe Terrestrial
DVB-C (QAM) Europe & USA cable (numerous variations)
DVB-H (QAM) Europe handheld
DVB-S (QPSK) Europe and USA Satellite

- **8VSB disadvantages**
  Modulation scheme is very complex
  Fixed 19.4 MegSymbol data rate and 6MHz bandwidth are not modifiable
  Amplitude modulation (vestigial sideband) needs hi linearity amps
  If amps are not linear enough – too many transmit errors & screen blanks
  Audio channel not receivable on some TV sets
  Ham band not available on standard unmodified TV's
    430-450 no good - cable setting in some TV's default to QAM
    902-915 no good – above TV tuning range & crowded with Wi-Fi
    1240-1300 no good – this is above TV tuning range
  Special receive converter required for Ham applications
  Cannot use when receiver is in motion (no mobile operation)

- **DVB-T disadvantages**
  Receivers not in use in USA
  Needs high signal to noise ratio receivers
  DVB-T set top boxes not available in US

- **DVB-C disadvantages**
  No common standard. Many variants used by each cable company
  Common receiver not available

- **DVB-H disadvantages**
  No well defined standard
  No receivers available



## DVB-S – Why is it best for D-ATV?

### DVB-S Advantage Summary

Used Free-to-air Receivers are readily available
Receivers are "cheap" - $10 to $50 on EBay
New receivers are $125 at local satellite stores
High linearity amplifiers not required to transmit error free signal
If amps not linear – excessive transmit signal spectral regrowth occurs but minimal errors
Inexpensive LDMOS "brick" amplifiers for transmit can be used and are easy to build
Format multipath cancellation is adequate for Ham use
Modulation method not subject to motion limits – tested OK for mobile
Less bandwidth needed than others for acceptable picture
Bandwidth modifiable for motion/resolution tradeoff selections
Multiple video channels within single carrier possible
Seems best for Ham space shuttle D-ATV communication

## DVB-S details

### Modulation method

QPSK (frequency modulation) is used exclusively here. QPSK (Quadrature Phase Shift Keying) basically means that the signal is phase (FM) modulated in 4 quadrants of 360 degrees to essentially contain at least 4 times the data as a simple FM signal.

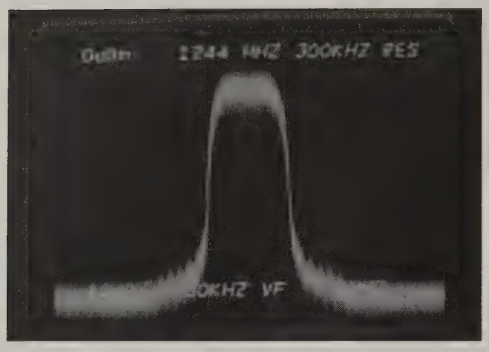
### Encoding

As in most other standards, MPEG2 is used here also for data encoding. Forward error correction is employed using Viterbi and Reed-Soloman coding to correct for noise and multipath effects. The degree of correction is selectable as needs dictate making DVB-S very desirable because it allows the user to change it for various conditions.

### Linearity requirements

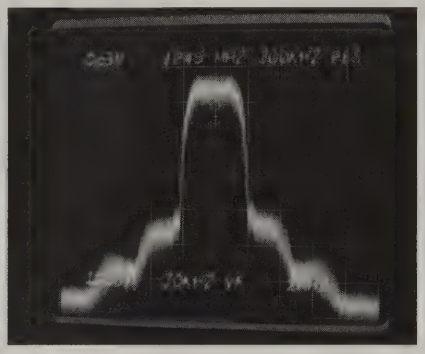
Linear amplifiers in the transmit chain can become VERY expensive. Therefore it is important for Ham use to employ the transmission method most tolerant of non-linearities. DVB-S is it! Since the modulation method is frequency modulation, it is inherently insensitive to non-linearities. This is not entirely so but it is found that an amplifier can be close to its 1dB compression point before the error correction approaches its limit. This is HUGE as it opens up the transmitter design choice tremendously. Simple LDMOS "brick" amplifiers like the Mitsubishi RA18H1213G unit are ideal for use on the 1240-1300MHz band to get a 10 watt (average) digital signal from as little as a 50 milliwatt source. That brick has a bias input allowing for adjustment of FM or linear operation making it easy to see what the limit is for a given configuration. Now, non-linearities DO cause other problems though. Each time the signal passes through an amplifier stage, it creates spectral regrowth in the output waveform proportional to the degree of non-linearity. These are sidebands above and below the main envelope at a reduced amplitude level. Therefore, although the signal has minimum errors, the overall bandwidth will be wider. This may be a problem in some cases where the allocated channel is defined or where it just makes sense to minimize spectrum interference. The bottom line is to choose the highest linearity amp affordable then use a good interdigital type of steep skirted bandpass filter to remove the remaining sidebands. See the spectrum analyzer comparisons below.

Square sides with very little sideband energy.



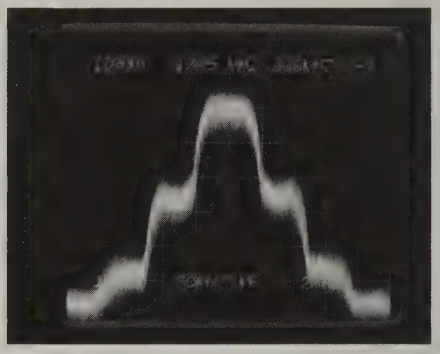
Output from modulator Level ~ 2 milliwatts

Increased spectral regrowth in first amp. Is about 30dB below carrier



Output from Kuhne 2.5 watt "hi linearity" amp

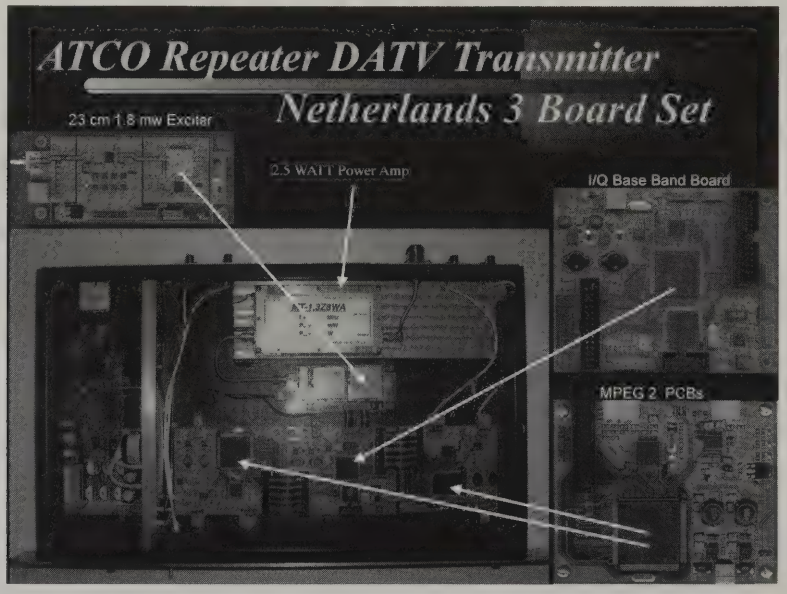
Spectral regrowth amplified in second amp. is now only 20dB below carrier.



Output from 18 watt LDMOS brick amp before output filter

**Power level measurements**

At this point it is worth noting that output power level measurements using a standard "Bird" wattmeter are NOT accurate. The output spectrum envelope is somewhat rectangular instead of sinusoidal so average power measurements do not apply. Because of this rectangular waveshape, most of the power is at peak values longer making measurements with a "Bird" or bolometer wattmeter read higher than they actually are. I personally feel that the only meaningful value is the actual peak reading obtained reliably with a spectrum analyzer. If you use a" Bird", I'd divide its reading by at least 3 to get the actual transmit power. Also, when designing an amplifier chain, I'd make sure the amplifier input will handle 10 times more input power than the peak value of the digital signal. (100 mw peak DATV signal to a 100 mw rated amplifier to prevent excessive power dissipation).


ATCO Repeater DATV Transmitter
Netherlands 3 Board Set
23 cm 1.8 mw Exciter
2.5 WATT Power Amp
I/Q Base Band Board
MPEG 2 PCBs

## ATCO REPEATER SUMMARY

The ATCO Group Inc., originally organized in 1980, is located in Columbus, Ohio USA and serves approximately 85 ATV'ers within a 50 mile radius. It is our purpose to further the exchange of information and cooperation between members, promote amateur television knowledge, fraternalism and individual operating excellence and conduct activities that advance the ATV general interest and welfare.

- We operate an ATV repeater installed in the fall of 1994 with 5 outputs (427.25MHz AM, 1245MHz DATV (DVB-S), 1260MHz FM, 2433MHz FM and 10.450GHz FM) and 4 inputs (439.25MHz, 1280MHz analog/DATV, 2398MHz and 10.350GHz). A 3 watt DVB-S output was installed January 2004 and has been in operation 24-7 since then. A 10 watt amp was added in June 2009.

- We conduct weekly "net" meetings on 147.48MHz at 9:00 PM EST/EDT on Tuesdays that serves to introduce newcomers, discuss ATV topics and announce news. It is the simplex "gathering spot" for audio activity with control capabilities for the ATV repeater.

- Recently we began streaming our weekly Net meetings on the internet for the benefit of those beyond the metropolitan Columbus, Ohio area. All are welcome to join in. Just tune in at WWW.BATC.TV , select "ATV Repeaters" then scroll down to WR8ATV and then click on "view stream". There you can both see and hear us during the Net starting at 9PM. The streaming is on every Tuesday from approximately 8:30PM EST/EDT till about 10PM or whenever the Net closes.

- We publish a Newsletter 4 times a year containing local events, late breaking ATV news, construction articles, tips/techniques, meeting announcements and whatever else we can find that has ATV interest. The newsletter and other ATV topics can be viewed on our internet homepage at WWW.ATCO.TV.

- We help provide security video coverage each year for various local public events such as our annual Independence Day fireworks show (which draws over 500,000 observers), various parades, local air shows and observation video of airport disaster drill activity. We also provide local severe weather observation to help identify potential damaging storms to the public.

- We have Spring and Fall Events where we gather to share ideas, plan future activities, enjoy free food, have door prizes (for everyone) and usually conduct a mini Hamfest with trunk sales in the meeting place parking lot. We normally have a few Pizza parties where we can have pizza while enjoying the companionship of others.

- We are working on a link to connect the Columbus and Dayton repeaters. We found an ideal site halfway between us (35 miles from Columbus and 30 miles from Dayton) that we have been working on for a number of years now. We had it operational before the Dayton repeater had to relocate and now have started over. We are considering a digital link but are concerned about the latency issues. That is, there is a 1 to 2 second delay in sending and receiving the signal so a full duplex link may turn out to be difficult for acceptable communication. With a repeater link, the delay is effectively doubled because it occurs at both ends!

**ATCO DVB-S Operational results**

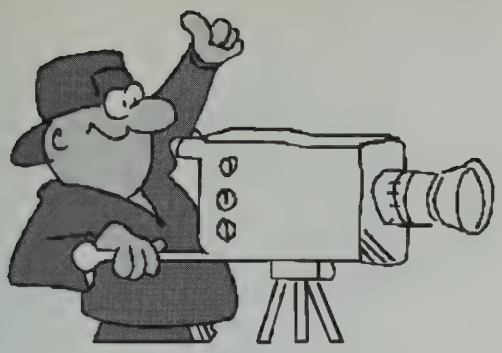
Our digital (DVB-S) 1245MHz signal has been operational since January 2004 with a 2.5 watt signal receivable within about a 20 mile range. Recently we added a power amp to boost the output to about 10 watts average extending the range to roughly 40 miles. There are about 15 ATCO club members with digital receive capability using surplus "Free To Air" digital receivers obtained on EBay for about $50 each. Some additional people have obtained various receivers from EBay and elsewhere for $10 to $75. All have worked ok and have had no trouble locking onto our DVB-S signal using only a minimal loop yagi antenna mounted less than 30 feet in the air. I personally have a 20 element loop yagi mounted 30 feet up my tower permanently pointed to the repeater 15 miles away connected to 75 feet of 7/8" Heliax. In the shack I have a 2 way splitter with my analog receiver connected to one port and the digital receiver connected to the other. Tests have proven there is 10dB of excess signal needed for simultaneous P5 picture reception on both receivers.

The transmitter DVB-S board set of choice is the Netherlands D-ATV boards. We use (2) MPEG-2 encoder boards connected to an I/Q baseband board and then to a 1.8 milliwatt modulator/exciter board providing us with two channels of video. The 1.8 milliwatt signal is fed to a Kuhne Electronics ultra linear amplifier (we were told high linearity amps were a MUST at the time) costing about $500 alone. The Kuhne 2.5 watt output was connected directly to the antenna until recently when an LDMOS "brick" amp was added to produce a 10 watt (average by Bird) signal. That output is fed to a custom made interdigital bandpass amp with steep skirts with a bandpass of 5 MHz. Using 3.125 megSymbol rate with a 3/4 FEC, our overall signal is about 4 MHz wide excluding the spectral regrowth sidebands. This correlates closely with the formula, ***signal bandwidth = 1.3 x symbol rate***. With the filter in place the resulting signal on a spectrum analyzer looks very clean with the regrowth signal down more than 50dB from peak carrier.

We have tested mobile operation with great success. The DVB-S modulation scheme is supposed to be reasonably insensitive to motion and we proved that it indeed is! The vehicle in motion was accelerated to over 50 MPH with no loss of signal. In fact, the normal signal flutter and fading was very surprisingly non-existent. While traveling under a bridge underpass, the signal was maintained with only a momentary picture freeze unnoticeable if not looking for it. The normal analog mobile ATV signal flutter which was very annoying was virtually gone with digital!

Finally, a word about why we ended up using 1245 MHz for our digital signal. We originally had our analog signal on 1250 and digital on 1260. One morning my wife answered the phone and told me, "YOU HAD BETTER TAKE THIS CALL". It was the FCC from Detroit who had been tracking our analog ATV signal because of an interference complaint! It turns out that since our 1250 MHz signal identified with a bulletin board sequence for 4 minutes every half hour, it was interfering with the local Ohio Department of Transportation (ODOT) reception from a Russian GPS 1250 MHz signal used in their surveying efforts. Since ODOT couldn't find the interference source after 6 months of searching, they called the FCC. The FCC drove from Detroit to Columbus and found our signal source after about ½ hour. I was then contacted and initially told that we were ok and operating within our assigned band legally. Later I was notified that because of a recent FCC clause saying that interference to Radio-Navigation was prohibited in the 23cm band, we had to vacate. We finally ended up with our analog signal on 1260 and the digital one on 1245 leaving 1250 clear. That was ok till I added the power amp. Now the added spectral regrowth extended the upper bandpass to 1250 and again caused them interference. (They were not shy about telling me so). After I added the interdigital filter, no phone calls! So, it's a story worth telling because it demonstrates the real need for a good bandpass filter. I still tell others how we interfered with a Russian GPS Satellite! It sounds bizarre until you know the details.

ATVQ



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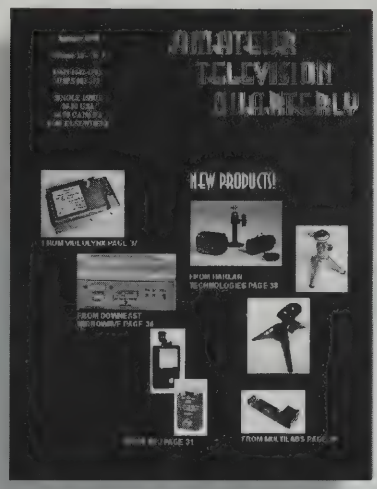

## ATV Secrets Vol I & II On CD

ATV Secrets is a great place to start your ATV adventure! Volume I has 64 pages, tightly packed with information covering all aspects of getting started, where to find activity,equipment, how to DX, and answers frequently asked questions about power, antennas, vestigial sideband operation and more. Everything the beginner in ATV needs!

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Volume II is sold out in the paper version, but available on CD.

**ATV Secrets Volume One (paper) $8.95**
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**ATV Secrets I & II on CD $25.00**
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# Television Timeline - part 2

*The Electromechanical Race* - *Denise Camp*

**The Electromechanical Race**
*1910--1930*

The 1900 World's Fair in Paris seemed to mark the end of a visionary period and the beginning of a new age where TV progressed from ideas to actual inventions.

While Vladimir Zworkin and RCA were developing a mechanical television, Philo Pharnsworth and his small, privately backed lab believed that an electrical transmitter was the way to go. Mechanical versus Electrical televisions became the great debate that ended in patent wars between individual scientists and large companies before World War II.

If the Paris World's Fair marked the transition of eras, so did the New York World's Fair of 1939. There television was actually demonstrated becoming the end of what seemed once an impossible dream and the beginning of a new age.

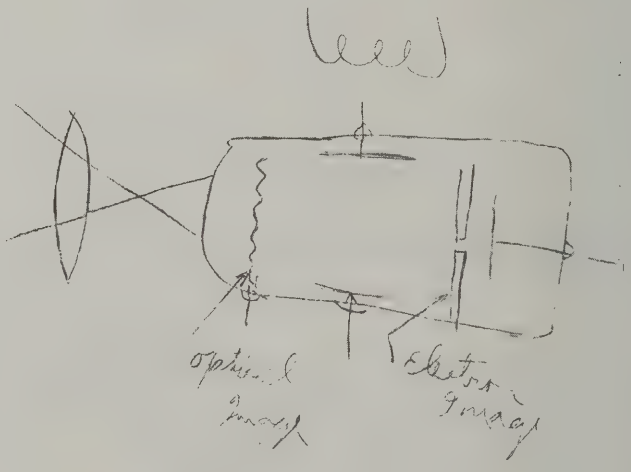
Large companies saw the new development as a money maker. Sadly, many individuals who stand out as visionary inventors and geniuses get overlooked. Our society does not seem to value such people nearly enough.

***1920***

Charles Jenkins (1867-1934) : Born in Dayton Ohio, Jenkins was quite the independent inventor. At a meeting of the Society of Motion Picture Engineers he introduced his Prismatic Rings, a device that replaced the shutter on a film projector. It was later used in the Radiovision system.

**1921**

Philo Farnsworth (1906-1971): At just fourteen, Farnsworth thought it futile to depend on a spinning disk to transmit pictures when a vacuum tube would be so much faster for transmitting current. His sketch for a television/transmitter turned into his high school science teacher was later used in a patent lawsuit.

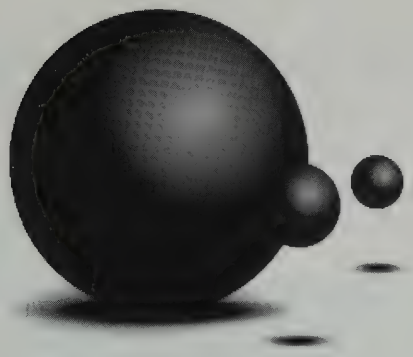


**1923**

--Charles Jenkins invented a mechanical television system called Radiovision.

--Vladimir Zworkin (1889-1982): Born in Russian and studied electrical engineering, he continued his work in America. He patented the Iconoscope, a TV camera tube based on Allan Archibald Campbell Swinton's ideas. This tube for television transmissions was a type of electric eye. It became the corner stone in the development of television.

 *Cont. on Page 24*



# Harlan Technologies

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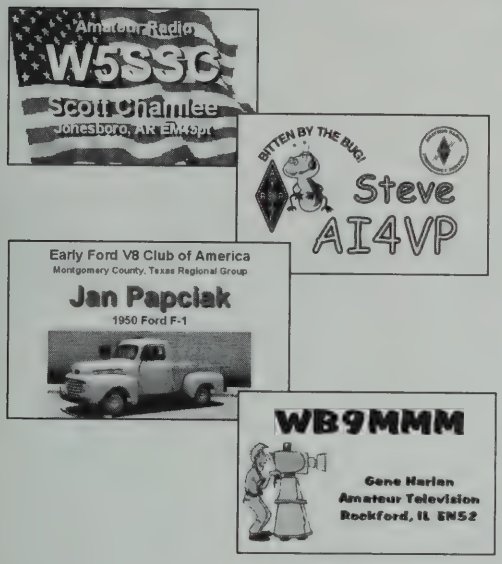


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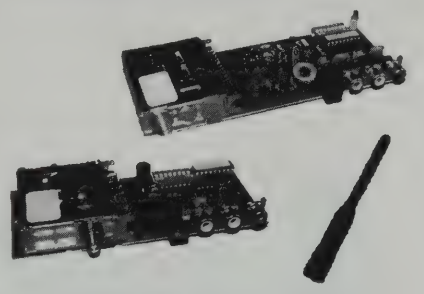

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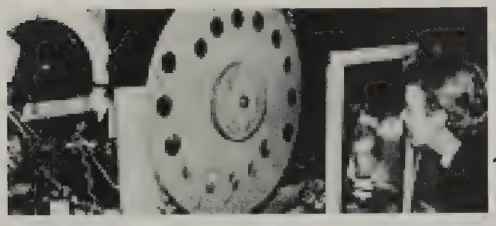
**1924**
The first televised pictures of an object in motion were transmitted.

**1925**
--John Baird (1888-1946): A Scotsman who sent a transmission of outlines of blurred geometric shapes a few feet in a department store demonstration in London.
--Charles Jenkins (two months after Baird) transmitted a whirling windmill publicly from Anacosta Virginia to Wisconsin.



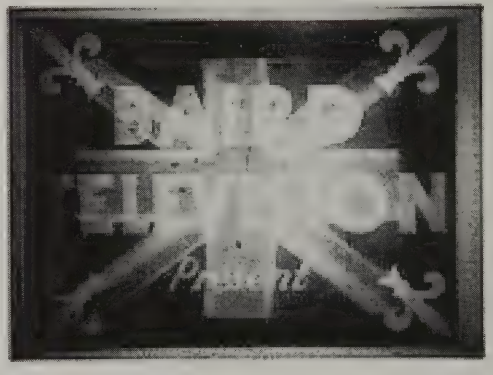
**1927**
**Baird mechanical TV system - 1926**

Philo Farnsworth transmitted with an electronic signal a line from one room to another.
Herbert Ives (1882-1953): An American scientist and engineer who headed the development of televisions system at AT&T rigged two 15 inch Nipkow disks to send to Bell Laboratory in New York. It was a small image of Herbert Hoover talking on the telephone. Hoover was then secretary of commerce and important in allocating radio frequencies in the 1920s.

**1928**
--Ernst Alexanderson (1878-1975): Swedish born electrical engineer who transmitted a smiling head on a tiny screen. He did this while working for General Electric.
--Charles Jenkins opened and operated North America's first television station with regularly scheduled telecasts of radiomovies produced by Jenks Laboratories Inc. Many complained about having to constantly tune the broadcast but thought it exciting.

**1926**
John Baird operated a television system with 30 lines of resolution running 5 frames per second. Mr. Baird had a diploma in electrical engineering. He, along with American Clarence Hansell, patented the idea of using arrays of transparent rods to transmit the 30 line image. His were the first demonstrations of television reflected by light rather than backlit silhouettes.

**Baird TV image transmitted across the Atlantic**



**Early Test Pattern**

**1927**

--Bell Telephone and the United States Department of Commerce conducted the first long distance use of television between Washington DC and New York City.

--Phil Farnsworth filed for a patent on the first complete electronic television system called an Image Dissector.

--Farnsworth welcomed Zworykin to his lab supposedly not realizing the RCA employee was on a spying mission about electronic television. Zworykin took back instructions and sketches of picture tubes and the Image Dissector

**1928**

--The first Trans Atlantic transmission of images of a human face was transmitted by John Baird. He introduced a color television stereoscopic for the first time.

--The Federal Radio Commission issued the first television station license W3XK to Charles Jenson.

**1929**

--The BBC was persuaded to broadcast on John Baird's system.

--Vladimir Zworkin demonstrated the first practical electronic system for both transmission and reception of images using his new kinescope tube, designed after visiting Farnsworth's lab..

--John Baird opened the first television studio.

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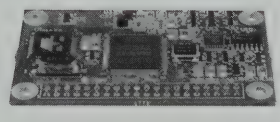

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# The Radiovisor Kit

*- Denise Camp*

**The Radiovisor**

The first television set in home was mechanical. Radiovisors were mechanical scanning-drum devices manufactured by the Jenkins Television Corporation, as part of their radiovision system. It was a multitube radio set that had a special attachmentfor receiving pictures, a cloudy 40 to 48 line image projected onto a six inch square mirror.
Jenkins sold Do It Yourself Kits for under $10 to individuals. They sold a few thousand. With the kit and the purchase of a small motor, radio hobbyists could transform a home radio into a Jenkins television set and watch live silhouette broadcasts.
"It was the beginning of everything," said Irma Kroman who worked for the Jenkins studio and appeared in many broadcasts.
It was also the end for Jenkins Studio. It began its nightly broadcasts a year before the Great Depression began.
Raido means electromagnetic radiation over airwaves, thus the use that Jenkins preferred that was later replace by the prefix "tele" meaning "over distance"

It Works!
YOU can now enjoy radiovision programs. Don't waste time, money and patience trying to work out your own equipment. Start right with Jenkins apparatus in convenient kit form or in ready-to-use form. Jenkins self-synchronous feature makes reception possible wherever signals are heard. Jenkins receivers, combined with Jenkins radiovisors, provide real television entertainment.
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Free literature on Kit, Circuits and Complete Apparatus.
NOTE: Indicate 60, 48 or 45-line scanning system

Founded in 1928, the Jenkins Television Corporation sold several thousand sets to the public that cost between $85 and $135. The radiovisor was a multitube radio set that had a special attachment for receiving pictures, a cloudy 40 to 48 line image projected onto a six-inch square mirror. Charles Jenkins preferred the names radiovisor and radiovision over television

One of the first names for television. "Radio" means electromagnetic radiation over airwaves, so radiovision was obvious. Later, "tele," meaning "over distance," became the preferred prefix.
Ohio inventor Charles Jenkins, an inventor from Dayton, Ohio, invented a mechanical television

system called radiovision and claimed to have transmitted the earliest moving silhouette images on June 14, 1923.

Charles Jenkins publicly performed his first television broadcast transmission, from Anacosta, Virginia to Washington in June, 1925.
Radiovisors were mechanical scanning-drum devices manufactured by the Jenkins Television Corporation, as part of their radiovision system.

**Jenkins Radiovisor Model 100 Factory Assembied version**

Founded in 1928, the Jenkins Television Corporation sold several thousand sets to the public that cost between $85 and $135. The radiovisor was a multitube radio set that had a special attachment for receiving pictures, a cloudy 40 to 48 line image projected onto a six-inch square mirror. Charles Jenkins preferred the names radiovisor and radiovision over television
One of the first names for television. "Radio" means electromagnetic radiation over airwaves, so radiovision was obvious. Later, "tele," meaning "over distance," became the preferred prefix. He used radio receivers that had a special attachment, which allowed the receivers to broadcast moving pictures on a six-inch square mirror. Jenkins made the first public display of his radiovision on June 23, 1925, although he claimed that he transmitted the first moving pictures via radiovision on June 24, 1923. Most scholars believe that Jenkins's earlier broadcast was a lie on Jenkins's part.
In December 1928, Jenkins formed the Jenkins Television Corporation in New Jersey to manufacture Radiovisors, Jenkins's radiovision receivers, and to market and form television stations across the United States. In 1932, De Forest Radio purchased Jenkins Television Corporation and, a few months later, sold the Jenkins component of the company to RCA, which immediately ended production of the Radiovisors and ceased transmitting programs to mechanical televisions.
The principal reasons for RCA's decision to cease broadcasting and to end production were the expensive cost of Radiovisors -- the sets routinely cost between eighty-five and 135 dollars per set -- and the poor picture quality of mechanical televisions. The pictures commonly were too dark for viewers to see any more than silhouettes. These silhouettes became known as shadowgraphs. Also, by the early 1930s, dramatic improvements had been made in broadcasting images through what was known
Jenkins Model 202 Radiovisor, 1929 (U.S.A.)
This mechanical scanning-drum unit was engineered, designed and manufactured by the Jenkins Television Corporation, a company founded in 1928 by the American television pioneer, Charles Francis Jenkins. As early as 1894, he presented an article in the periodical, Electrical Engineer, on a method of electrically transmitting pictures. He was one of the earliest to succeed at television transmission, and claimed to have executed the first reported transmission of television by radio in 1923. Hugo Gernsback of Radio News and Watson Davis of Popular Radio witnessed a demonstration in the same year. In 1928 Jenkins announced the birth of a new entertainment industry, "Radio Movies". Shortly thereafter, Jenkins Laboratories Incorporated initiated 48-line silhouette broadcasting through regularly scheduled telecasts over station W3XK and a few other stations that showed "Radio Movies". Jenkins preferred the term "Radiovision" to "Television", which explains this unit's name.

# K4NQV - SK

*- Submitted by Hank Cantrell W4HTB*

*- Reprinted from The Hamcall - Kentucky Colonels Amateur Radio Club*

***Dean Maggard K4NQV***

The community of Bowling Green and specifically KCARC has lost a great member. Dean passed away Wednesday July the 8th and was laid to rest July 13th 2009.
Dean was a leader in the field of communications both commercial and amateur radio. He was manager and Chief Engineer of WLBJ AM and FM here in Bowling Green. He was a charter member and founder of our Kentucky Colonel Radio Club, and has served multiple times as President plus receiving the "Ham of the Year " Award. Dean is survived by his wife Kittye KG4AJE, two children Robert and Debbie and 4 grand children.

Dean was the first to put a 2 meter repeater on the air in Bowling Green, was active in the local Amateur Television movement in the late 70's and most recently vice president of the newly formed ATN-KY (Amateur Television Network – Kentucky Chapter). He also served as web master for the Club's web page, and past editor of the Ham Call Newsletter.

I remember meeting Dean in the early 80's when moving to KY. I was looking for others interested in amateur television and found that Dean and Ben W4WSM had been active. I started working Dean from
Greensburg , KY then when I moved to Bowling Green, he got others involved. Dean was an innovator always willing to try new technology. I could always count on Dean to help me test or try new things.
We often shared equipment, and had a saying "I'll buy one if you will" which got us into a lot of STUFF ! We all will miss him and his humor, we will have a special page on the new ATV repeater for K4NQV.

*73 Dean de Hank W4HTB*

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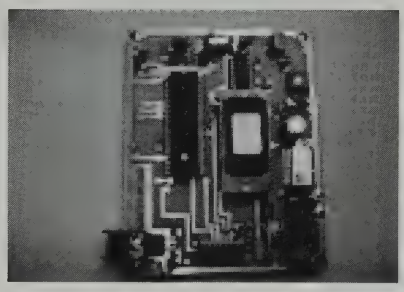

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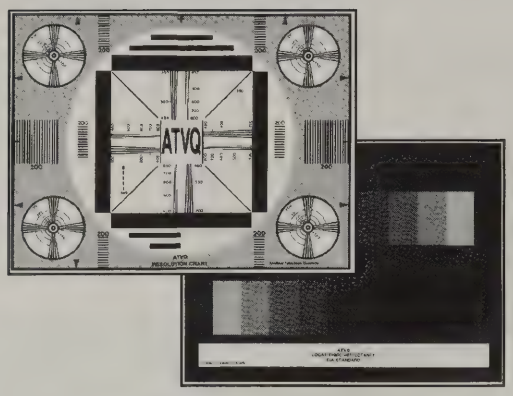


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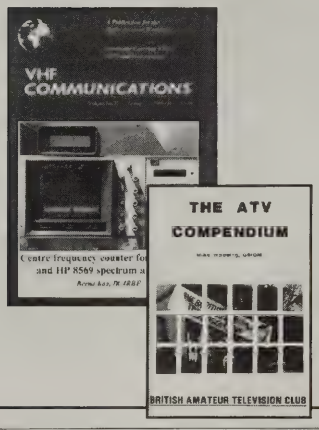


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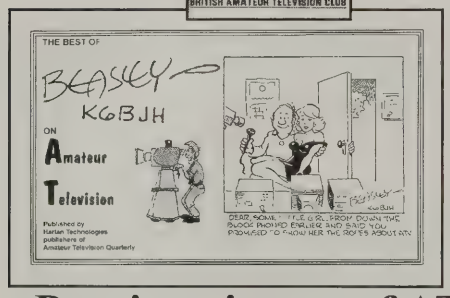


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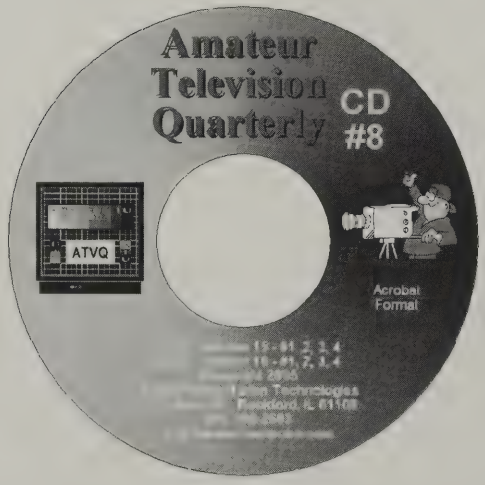


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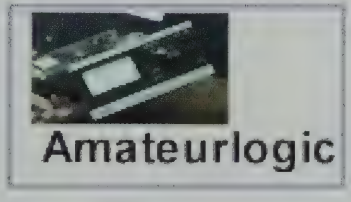
The deadline to submit your 2009 ATV contest logs has been extended to: January 5, 2010.

Rules and log forms are in the Spring 2009 issue on page 28
*(for contacts made between 06/01/2009 through 09/01/2009)*

We have received just one entry for the contest so please send us your logs

Winners will be announced in the next issue



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# The Visionary Years

Denise Camp

Every invention and discovery contributed to the development of Television. See if you know some of the names of inventions, discoveries, and inventors.

## Across

1 Images transformed into electric signals with light and selenium

4 Alexander Graham Bell's device that transmitted sound on a beam of light

7 Unit of inductance

9 CRT

## Down

1 Combination of a tool that copies drawings and the telegraph

2 1st to use the term television at the International Congress of Engineers

3 One of the 1st prototypes of television

5 Considered greatest American scientist since Ben Franklin

6 He patented the idea of using light and disks to send pictures but did not build it

8 Chemical element Se

**Answer Key to the Spring 2009 Crossword puzzle about early television**

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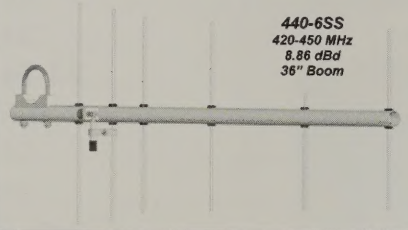

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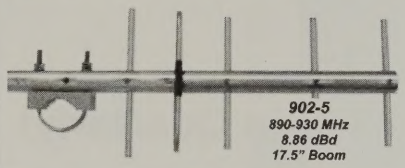

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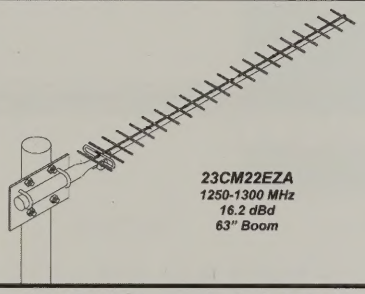

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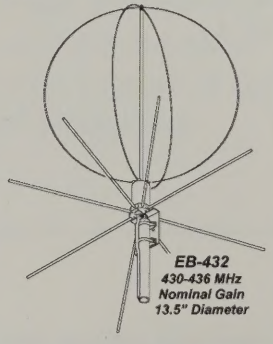
***439.250 MHz***
***(2) Stacked 8.8 dbd***
***4 3/4" Square***



***EB-432***
***430-436 MHz***
***Nominal Gain***
***13.5" Diameter***

***M2 ANTENNA SYSTEMS, INC.***
***4402 N. SELLAND AVE.***
***FRESNO, CA 93722***
***559.432.8873 FAX 559.432.3059***
***WWW.M2INC.COM***


## Payment for Technical Articles

ATVQ will pay for certain articles that it publishes. I will outline the policy here, but it will be subject to change as needed to make sure that ATVQ continues to be an ongoing publication. ATVQ will pay $25.00 for technical articles that are published and are a minimum of 2 pages. While this is not a great amount, I hope it will encourage more technical type articles to be written. Exceptions will be articles that are written by a manufacturer/seller of equipment that is being written about. While I do not want to discourage this type of article, the article itself is an advertisement of the product. Articles from clubs will be encouraged, and I would expect they would like to share their information with the ATVQ readership. Information gathered from the Internet will not be paid for and is mostly small filler items.

## Ideas

Do you have an idea for an article that you've said to yourself that you wanted to write, but never did. Feel free to check with us to see if it is of interest, or write and send it in. No guarantees that it will get published, but if you don't try, you will never know. I'll be looking to see what you can do!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1.5W 222MHz
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FM: 5 Watts
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"One-Touch"
NOAA WX

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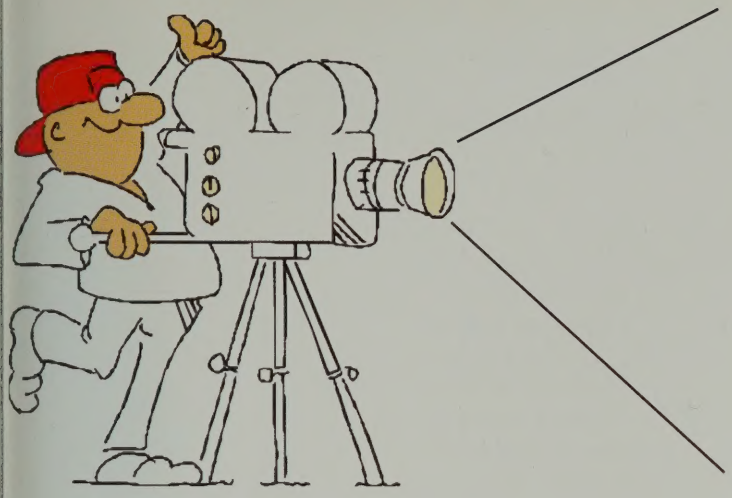


# ADVERTISE IN ATVQ!

ATV'ers are hams that build projects more than other hams. They have a varied background ranging from technician to engineer, and just might see a need for your product in their regular job as well as in their hobby. I hope to hear from you soon.

**Please call TODAY!**


Mike Collis - WA6SVT - Advertising
**RESERVE YOUR SPACE TODAY!**
**1-909-338-6887 - voice**
**email: wa6svt@atvquarterly.com**


| DEADLINES | | | |
|---|---|---|---|
| COVER DATE | COPY DEADLINE | TO PRINTER | MAILING DATE |
| WINTER | JANUARY 1 | JANUARY 15 | FEBRUARY 1 |
| SPRING | APRIL 1 | APRIL 15 | MAY 1 |
| SUMMER | JULY 1 | JULY 15 | AUGUST 1 |
| FALL | OCTOBER 1 | OCTOBER 15 | NOVEMBER 1 |

| AD RATES<br>Effective November 19, 2004 | | |
|---|---|---|
| | INSERTIONS PER YEAR | |
| SIZE | 1-3 | 4 up |
| FULL PAGE COLOR | $650 | $500 |
| FULL PAGE B&W | $160 | $140 |
| ADDITIONAL COLORS/PAGE | $100 | $100 |
| 1/2 PAGE B&W H or V | $110 | $80 |
| 1/4 PAGE B&W H or V | $85 | $55 |
| 1/6 PAGE B&W H or V | $55 | $38 |

Multi-page ads are billed at the combined rate based on frequency.
Covers are reserved for COLOR ads.
All typesetting and layout charges for non-camera ready ads will be added.
Covers II, III, IV $30 extra.
If negatives are not provided for color ads, add $50.

While we will try to adhere as close as possible to the above dates, we reserve the right to adjust as needed.

If material is going to be late, please call to check if it will meet our schedule. We will try to accommodate everyone as best as we can.

Camera ready art or negative film right reading down is acceptable.

Trim Size: 8 1/2 x 10 7/8
Bleed Size: 1/8" beyond trim
Live matter: 1/4" within border

ATV Quarterly reserves the right to reject any advertising which is not in keeping with the publishers standards. Previous acceptance of any ad will not prevent ATV Quarterly from exercising the right to refuse the same advertisement in the future. Advertising orders are subject to the terms on the current rate card. Advertisers assume all responsibility and liability for any claims arising from advertisements and will protect the publisher from same.

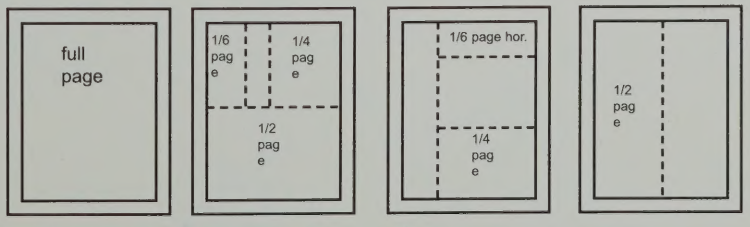
ATV Quarterly will position ads in ATVQ at its discretion except in the case of preferred positions specifically covered by contract or agreement.

If, for any reason, the publisher fails to publish an advertisement, it will not be liable for any costs or damages, including direct or inconsequential damages.

Terms: All accounts not pre-paid are billed net 30 days. All accounts over 30 days are billed at 1 1/2% per month. Prompt payment is always appreciated.

**RESERVE YOUR SPACE TODAY!**
**1-909-338-6887**

| AD SIZES | VERTICAL | | HORIZONTAL | |
|---|---|---|---|---|
| | Width | Height | Width | Height |
| FULL PAGE | 7" | 10" | --- | --- |
| 1/2 PAGE | 3 1/2" | 10" | 7" | 5" |
| 1/4 PAGE | 3 1/2" | 5" | 5" | 3 1/2" |
| 1/6 PAGE | 2 1/4" | 5" | 5" | 2 1/4" |




# Amateur Television Quarterly


**published by ATV Quarterly**
**P.O. Box 1594, Crestline, CA 92325**
**tel (909) 338-6887**
**Internet: http://www.atvquarterly.com email: wa6svt@atvquarterly.com**

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